1. OVERVIEW OF MARYLAND STATE HIGHWAY ADMINISTRATION PROCESS

1.1 Sectors

The Maryland State Highway Administration (SHA) is committed to meeting the requirements of the *Chesapeake Bay TMDL*, issued December 29, 2010, through compliance with the requirements established in *Maryland's Watershed Implementation Plan for the Chesapeake Bay Total Maximum Daily Load* (WIP I), issued December 3, 2010. SHA has land coverage in three sectors: Minor Processed Wastewater, Septic and Regulated Urban Stormwater.

The SHA coverage under the processed wastewater sector includes two permits for minor municipal facilities including the Sideling Hill rest area and the eastbound I-70 rest area; and seven permits for minor industrial wastewater discharges covering certain maintenance operations. Coverage under the Regulated Urban Stormwater sector includes both Phase I and II National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) stormwater discharge permit coverage for the SHA roadway network and industrial stormwater discharge permits for shops and maintenance facilities. Specific SHA requirements are discussed below.

Minor Processed Wastewater

According to the Maryland Department of the Environment (MDE) MD WIP I document, the strategies for non-significant municipal facilities will focus on projected flow and effluent limit concentrations of 18 mg/l for nitrogen and 3 mg/l for phosphorus with maximum annual pollutant loads not to exceed 6,100 lbs/yr for nitrogen and 457 lbs/yr for phosphorus. Conditions specific to total nitrogen and total phosphorus are discussed below for the SHA minor municipal Waste Water Treatment Plant (WWTP) Permits.

Permit No. MD0023680/07-DP-0650 I-70 Eastbound Rest Stop WWTP

The current permit conditions require that the 0.050 million gallons per day upgrade design meet target loads of 1,535 lbs/yr total nitrogen and 256 lbs/yr total phosphorus in order to meet the future TMDL for the Upper Potomac River watershed. Limitations for TSS are included in the current permit and are met.

Permit No. MD0062821/05-DP-2434 I-68 Sideling Hill Rest Area WWTP & WTP

The current permit conditions require that as the Upper North Potomac River or Little Tonoloway Creek TMDL documents for nutrients are completed, the permit may be revised to incorporate limitations. Limitations for TSS are included in the current permit and are met.

Septic

SHA has 25 shops, offices and/or maintenance facilities in the Chesapeake Bay (Bay) watershed that utilize on-site sewage disposal systems (OSDS).

Regulated Urban Stormwater

Requirements for regulated stormwater represent the largest TMDL compliance challenges for SHA. SHA maintains MS4 permit coverage for the SHA roadway storm drain systems in all nine (9) Maryland MS4 Phase I counties (Anne Arundel, Baltimore, Carroll, Charles, Frederick, Harford, Howard, Montgomery and Prince Georges) and in the two (2) MS4 Phase II counties (Cecil and Washington). Figure 1 depicts SHA MS4 coverage.

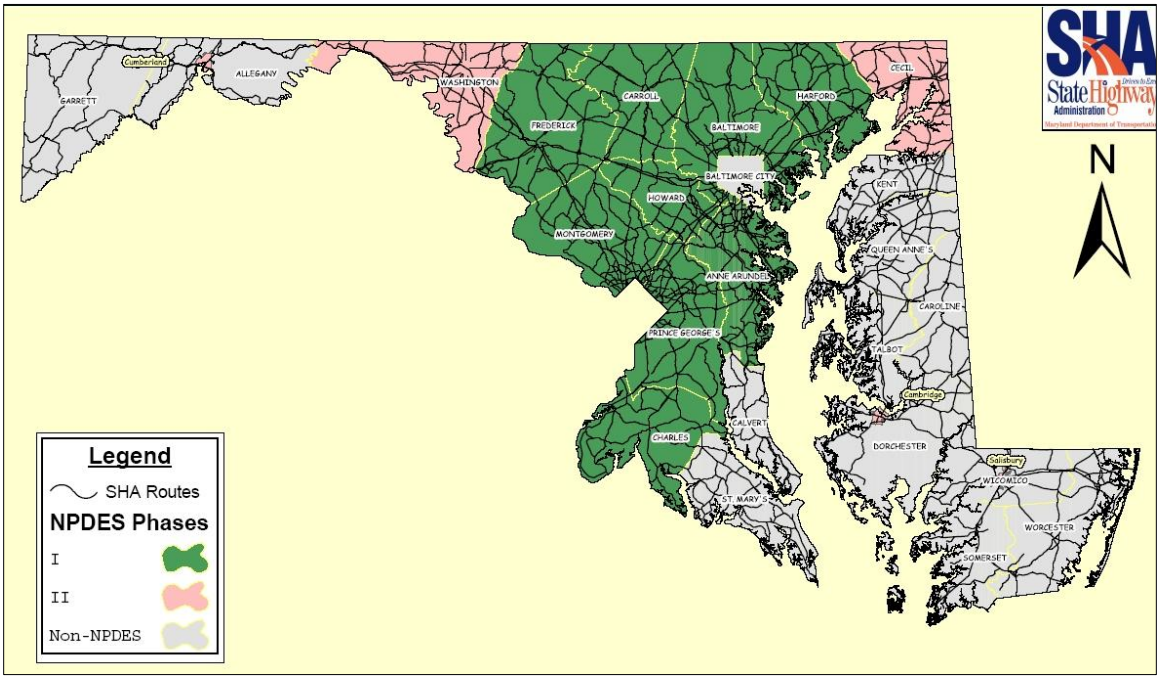

Figure 1 SHA MS4 Permit Coverage

Requirements for SHA in the WIP I document focus on SHA MS4 areas for stormwater. No specific requirements have been imposed on SHA for non-MS4 areas and the Maryland Assessment Scenario Tool (MAST) has no land use acreages attributed to SHA outside of MS4 areas. Table 1 lists waste load allocations (WLAs) determined by the MDE for SHA compliance with the Bay TMDL and are the SHA components of the overall limits of pollutants that can be discharged to the Bay and still meet water quality standards. The 2017 SHA target load is 60 percent of our reduction requirement based on the MDE 2009 baseline progress scenario.

Table 1. SHA WLA and Impervious Treatment Requirements for Regulated Urban Stormwater Sector

	TN (LBS/YR)	TP (LBS/YR)	TSS (LBS/YR)	Impervious Surfaces (I/II)
SHA Phase I/II MS4 WLA (DEL)	433,358	25,336	-	-
SHA Phase I/II MS4 WLA (EOS)	764,772	43,574	27,270,536	-
2017 SHA Target Load (EOS) (60% WLA Reduction)	825,095	50,611	30,782,560	30%/20%

The WLAs are expressed as 'delivered' (DEL) or 'edge-of-stream' (EOS). The DEL loads reflect losses during transport from the source to the Bay while EOS loads reflect loads transported from the source to the nearest stream.

1.2 Coordination with Local Teams

Because SHA maintains statewide coverage within Maryland, we are not associated exclusively with any one local team. As the process unfolded under MDE and MD Department of Natural Resources (DNR) direction, SHA participated in workshops, webinars and, as our resources allowed, in local team meetings. In developing strategies for the WIP II process, SHA focused on the statewide level and will develop county-level strategies as part of the 2012-2013 milestone. This will enable SHA to benefit from the county WIP II documents in developing our strategies as well as to identify potential partnering opportunities with local and county officials.

SHA will also continue to coordinate with local watershed groups and resource agencies, including the DNR, MDE, US Fish and Wildlife Service, US Army Corps of Engineers and the US Environmental Protection Agency (EPA) to explore partnership opportunities that are beneficial for all parties. SHA has met with a number of these agencies to discuss various opportunities and will continue to coordinate with them as the process moves forward.

1.3 Internal Process

SHA convened an internal workgroup/oversight committee to bring all design, construction and operations functions within the SHA together to discuss the requirements, develop strategies and address programmatic and funding gaps. Training was developed and given to all seven (7) SHA district offices including design, construction and maintenance managers and TMDL liaisons have been designated for each District to address local implementation and coordination.

SHA is a modal of the Maryland Department of Transportation (MDOT) and several briefings have been undertaken with the Secretary and Deputy Secretary in order to alert the Department of the impact this initiative has on the Department and State budget. An additional briefing was given to the Maryland Department of Legislative Services on August 31, 2011. The Maryland Blue Ribbon Commission (BRC) on Transportation Funding completed its deliberations and the resultant report to the Governor with recommendations for increasing funding to the Maryland Transportation Trust Fund (TTF) was issued November 1, 2011. The report is available on the MDOT website at: www.mdot.maryland.gov/Planning/BRC. The Commission was informed of the TMDL requirements as part of their deliberation process.

MDOT is anticipating the cost to implement the WIP for all of MDOT modes to be approximately $1.5 billion. MDOT will submit a report to the Chairs of the State committees on budget and taxation that outlines how MDOT will fit this cost into its capital program including any changes in project priorities or new funding mechanisms. Furthermore, MDOT will discuss how it will manage meeting the goals of the WIP. MDOT is currently projecting the SHA spending for the next few fiscal years as shown in Table 2.

Table 2. MDOT Fiscal Year Funding Projections for SHA Capital Budget TMDL Expenditures (Millions)

	FY 12	FY 13	FY 14	FY 15	FY 16
Existing Funding	$7.0	$21.1	$27.9	$16.6	5.6
Needed Funding		$59	$90	$141	$150

It must be noted that implementation of the SHA strategy will not result in a straight line progression with uniform funding levels each year. State procedures from planning to implementation, including contract procurement, design, right-of-way acquisition and permitting, will result in a gradual build-up of capacity to deliver this type of program with a greater need for funding occurring in FY15 and thereafter. It is likely that costs will rise again following the EPA reevaluation of TMDL implementation progress in FY17. By then it is likely that we will have exhausted the less expensive and readily available opportunities and increased construction activity over design activity.

TMDL implementation projects are among the top priorities for MDOT, but they need to be balanced and therefore financed with other projects in mind as well. MDOT will not compromise the safety of our citizens to fund these projects, but we also cannot ignore the requirements of compliance with the Bay TMDL. With these caveats in mind, it is clear that the WIP goals cannot be met without an increase in revenue to the TTF, no matter how strategically we approach this initiative. Hence, MDOT is expected to pursue methods or proposals to seek increase in the TTF starting with the upcoming legislative session. Funding expected in the Governor's revenue bill is $613 million per year for state and local purposes.

Along with the need for capital investments, SHA will need in-house and consultant resources to deliver the program of this magnitude. Currently SHA has initiated additional efforts with existing resources that are available due to the slower highway capital program. As the highway program picks up, resource needs for the TMDL program delivery will need to be supplemented. This need is at odds with on-going efforts towards reduction of State workforces. If not addressed, simply providing capital funds may not assure a fiscally responsible delivery of the program for the State.

2. MARYLAND SHA PHASE II WIP STRATEGIES

2.1 MS4 Phase I/II Urban Stormwater Milestones

The SHA compliance efforts within the MS4 permitted areas are shaped by the MDE guidance for MS4 permit holders entitled *Accounting for Stormwater Waste Load Allocations and Impervious Acres Treated*, DRAFT June 2011 (NPDES Accounting Protocol). Over the next thirteen years, the SHA will focus on bringing Maryland highways into compliance with the MDE WIP, the NPDES MS4 Phase I and II permits, and local TMDLs by implementing the following TMDL and stormwater BMPs:

2011 Milestone (July 2009 to June 2011 plus BMPs missing from the Bay model)

- Bioretention/Rain Gardens 91 Drainage Area Acres (AC) Restored

- Dry Detention — 306 Drainage Area AC Restored
- Extended Detention Ponds — 25 Drainage Area AC Restored
- MS4 SW Retrofits — 462 Drainage Area AC Restored
- Catch Basin Cleaning — 7,073,080 LBS Annually
- Urban Filtering — 175 Drainage Area AC Restored
- Urban Infiltration (no sand/UD) — 321 Drainage Area AC Restored
- Urban Stream Restoration — 21,168 LF of Streams Restored
- Urban Tree Planting — 721 AC Planted
- Vegetated Open Channel — 6,800 Drainage Area AC Restored (Assuming 6,729 AC in open section roadways and the remaining in open channel BMPs)[1]
- Wet Ponds & Wetlands — 1,451 Drainage Area AC Restored

2013 Milestone (July 2011 to June 2013) – 10% Implementation

- Bioswales — 292 Drainage Area AC Restored
- MS4 SW Retrofits — 273 Drainage Area AC Restored
- Urban Stream Restoration — 14,000 LF of Stream Restored
- Urban Tree Planting — 724 Acres Planted
- Wet Ponds & Wetlands — 12.3 Drainage Area AC Restored

2017 Milestone (July 2013 to June 2017) – 60% Implementation

- Bioswale — 142 Drainage Area AC Restored
- Forest Conservation — 50 Acres existing Forest within SHA R/W Conserved
- MS4 SWM Retrofit — 242 Drainage Area AC Restored
- Outfall Stabilization (i.e., RCS) — 1,625 Drainage Area AC Restored
- Urban Filtering — 260 Drainage Area AC Restored
- Urban Infiltration (sand/No UD) — 98 Drainage Area AC Restored
- Urban Stream Restoration — 9,300 LF Restored
- Urban Tree Planting — 1,167 AC Planted

2025 Milestone (July 2017 to June 2025) – 100% Implementation

- Bioswale — 823 Drainage Area AC Restored
- MS4 SW Retrofit — 776 Drainage Areas AC Restored
- Outfall Stabilization (i.e., RCS) — 5,216 Drainage Area AC Restored
- Urban Filtering — 171 Drainage Area AC Restored
- Urban Infiltration (sand/No UD) — 315 Drainage Area AC Restored
- Urban Stream Restoration — 30,000 LF Restored
- Urban Tree Planting — 3,045 AC Planted

[1] SHA is in the process of working with the WMA NPDES regulators to develop a protocol for identifying and documenting open section roadways and channels that will be considered to be providing impervious treatment within the MS4 permit requirements. For WLA reduction, we are using the vegetated open channel to model the reduction in loads.

2.3 Minor Municipal Wastewater Milestones (Non-Significant Municipal WWTP)

No milestones are proposed at this time.

2.2 Industrial Processed Wastewater Milestones (Non-Significant Industrial WWTP)

No milestones are proposed at this time.

2.4 Septic Milestones (OSDS)

No milestones are proposed at this time.

2.5 Programmatic Milestones

2013 Milestone (July 2011 to June 2013)

- Allocate current funding to implementation strategies and assess needs for future milestone funding. Develop implementation plan for future BMPs to become action items as funding becomes available.
- Develop 'roadway disconnection' protocol and obtain approval from MDE of methodology.
- Develop and implement program to upgrade outfalls. Obtain full implementation and completion of outfall inspections within MS4 Phase I counties.
- Complete county-level TMDL implementation strategy within MS 4 Phase I and II counties (in cooperation with NPDES MS4 Phase I Permit requirement for TMDL Implementation Plan for SHA). Develop county-level MAST scenarios as needed.
- Complete development of programmatic funding and resource needs assessment (program development and implementation staffing/maintenance activities/ dewatering facilities/ equipment acquisition).
- Complete development of tracking tools.
- Quantify maintenance erosion & sediment control and permanent stabilization improvement needs.
- Participate and partner with MDE, and other counties towards development of alternative strategies and establishment of efficiencies for currently known or new BMPs.
- Initiate needed research or synthesis efforts.
- Develop Memorandums of Agreement (MOAs) or general permits with regulatory agencies.

2015 Milestone (July 2013 to June 2015)

- As funding becomes available, activate next increment of the implementation plan.
- Explore partnering or MOAs with interested public agencies for right-of-way dedication for implementation or other partnership opportunities.
- Evaluate existing open section roadways within MS4 Phase I areas according to above protocol and provide documentation to MDE of available credit.
- Completion of outfall inspections within MS4 Phase II counties.

- Work with FHWA and others on Watershed Resource Registry (WRR) efforts to identify watershed-scale opportunities for stormwater management.
- Assess the SHA implementation plan effectiveness and make necessary changes and/or adjustments.

2017 Milestone (July 2015 to June 2017)

- As funding becomes available, activate next increment of the implementation plan.
- Evaluate existing open section roadways within MS4 Phase II areas according to above protocol and provide documentation to MDE of available credit.
- Outfall remediation within MS4 Phase I counties 60% completed.
- 60% implementation of street sweeping and catch basin cleaning.
- Assess 2017 goal implementation and refine plan for 2025 implementation.

2019 Milestone (July 2017 to June 2019)

- Explore trading needs and opportunities.
- Additional milestones as identified in 2017 evaluation.

2023 Milestone (July 2019 to June 2023)

- Outfall remediation within MS4 Phase II counties 100% completed.
- Additional milestones as identified in 2017 evaluation.

2025 Milestone (July 2023 to June 2025)

- Outfall remediation within MS4 Phase I counties 100% completed.
- Full implementation of street sweeping and catch basin cleaning.
- Full implementation of TMDL strategy.

3. TRACKING, VERIFICATION AND REPORTING METHODS

SHA has an established geodatabase that contains the required MS4 storm drain assets that have been collected over the last ten years in compliance with the Phase I and II MS4 permits. The data includes stormwater management facilities, major outfall inspections, storm drain conveyances such as pipes and ditches, storm structures such as manholes, endwalls and inlets, and illicit discharge sampling results. SHA will continue to deliver this data to MDE according to required database protocol as annual report delivery for the NPDES MS4 Phase I permit and to the Bay program annually. This data will also be instrumental in developing and implementing key components of the strategy including outfall remediation program, MS4 stormwater retrofits and developing county-level strategies.

Spatial data is also being developed for the various TMDL strategies outside the storm drain MS4 data such as tree planting, stream restoration, street sweeping routes and watershed restoration. A data review team comprised of staff from the various offices participating in the TMDL implementation projects will provide quality assurance/quality control reviews of all spatial and tabular data.

SHA is developing a custom application in a Geographic Information System (GIS) environment that will track and generate reports for various parameters. Some potential reports can include TMDL 2-year milestone progress, MS4 database annual delivery, the SHA business plan data, Bay expenditures data and implementation status for StateStat or BayStat. The application will be housed in the SHA Enterprise GIS (eGIS) environment and will be accessible by SHA employees.

Tools developed by MDE or EPA such as MAST or the National Environmental Information Exchange Network (NEIEN) will continue to be utilized as needed and/or required.

4. TECHNICAL DISCREPANCIES AND RECOMMENDED FUTURE STEPS

4.1 Results from SHA MAST Scenarios

Output from the MAST for our 2025 scenario (Table 3) indicates that the strategy will meet the delivered loads for sediment and total nitrogen and 90% of the delivered load for phosphorus. In order to meet the phosphorus WLA at 100%, SHA will need to manage approximately 1,896 LBS/YR more phosphorus (using the 2009 baseline provided by MDE). This additional load reduction will be worked into our county-level scenarios that will be completed by the 2013 milestone.

Table 3. MAST Output & Pollutant Load Comparisons (LBS/YR)

Source	N-EOS	N-DEL	P-EOS	P-DEL	S-EOS	S-DEL
SHA 2009 Baseline	915,580	541,753	61,166	37,726	36,050,596	29,262,360
SHA 2017 Output	792,956	468,795	50,977	31,194	14,328,809	10,533,952
Target 2017 Load (60%)	825,095	476,716	50,611	30,292	30,782,560	24,685,077
SHA 2025 Output	703,113	415,250	43,569	26,541	6,569,977	5,142,839
Target – 2025 WLA	764,772	433,357	43,574	25,336	27,270,536	21,633,555
Target 2025 Reduction	150,808	108,395	17,592	12,390	8,780,060	7,628,805
2025 Reduction Achieved	212,467	126,503	17,597	11,185	29,480,619	24,119,521
Percent of 2025 Goal	141%	117%	100%	90%	336%	316%

A concern SHA has with the 2025 MAST scenario output is the fact that it is not meeting the phosphorus reduction goal while at the same time exceeding the nitrogen and sediment

reductions. It is known that non-soluble phosphorus is tied to sediment and there would be a certain level of correlation between the phosphorus and sediment reductions. But what we are seeing in the output in our scenarios contradicts this expected outcome. In fact, our 2011 current capacity scenario exceeds the sediment reduction goal without any additional BMPs being implemented, while the 2025 scenario is not meeting the phosphorus reduction goal after the strategy is fully implemented. What other explanations or guidance can be offered to help us dissect the results to develop an equitable solution for meeting the phosphorus load?

Street Sweeping

Currently, the efficiencies used in MAST for Street Sweeping Pounds do not provide nutrient reductions and sediment is the only pollutant reduced by this BMP. Street Sweeping Mechanical Monthly provides nutrient reductions and must be swept twice per month or 25 times a year. SHA has a strong interest in utilizing street sweeping as a strategy for meeting the pollutant load reductions and will propose and conduct research to evaluate nutrient removal effectiveness related to both the mass loading method (LBS) and the frequency of sweeping. SHA will pursue this in cooperation with MDE and as prescribed for approval of BMP efficiencies by the Chesapeake Bay Program as outlined in the *Protocol for the Development, Review and Approval of Loading and Effectiveness Estimates for Nutrient and Sediment Controls in the Chesapeake Bay Watershed Model*, March 15, 2010.

Street Sweeping Mechanical Monthly will be added to some of the county-level scenarios that are under development and SHA is committed to provide this sweeping frequency when possible. Street sweeping cannot be performed during freezing conditions, however, due to the use of water in the sweeping process there is the potential of causing icy conditions along the sweeping routes. Also, during winter precipitation events when the application of deicing agents occurs, sweeping is curtailed in order to allow the deicing agents to remain on the travel lanes. For these reasons, street sweeping along routes designated for the Street Sweeping Mechanical Monthly BMP, may be swept less frequently during the winter months.

For streets that are currently swept, but less frequently than twice per month or 25 times per year, Street Sweeping Pounds will be used until efficiencies are established for nutrient reductions at less frequent sweeping intervals.

Catch Basin Cleaning

MAST and the Bay Model do not currently include Catch Basin Cleaning as an urban stormwater BMP, but the NPDES Accounting Protocol does include it in the mass loading method of calculating reductions. Because SHA will be required to demonstrate pollutant load reductions and impervious treatment for the MS4 Phase I and II permits using the NPDES Accounting Protocol, we used the Street Sweeping Pounds for catch basin load reduction in MAST. Catch basin cleaning is a routine part of SHA maintenance operations and provides significant sediment reductions at a minimum. To demonstrate this, SHA will pursue developing research to characterize debris removed during catch basin and pipe cleaning and pursue inclusion of catch basin cleaning as a BMP in the Bay model according to the review protocol.

4.2 Impervious Equivalencies for Alternative BMPs

Although the urban stormwater sector is provided with WLAs for the pollutants of concern, the MDE WIP I document lists treatment of pre-1985 impervious surfaces as the requirement for SHA Bay TMDL compliance for the MS4 phase I and II permit areas (30% for phase I and 20% for phase II by 2017). For urban BMPs that treat impervious surfaces directly, this accounting will be straightforward based on the land uses within the area draining to the urban BMP. But for the alternative BMPs such as stream restoration, urban tree planting, urban forest buffers, outfall stabilization and forest conservation (including agricultural BMPs that can be applied, see discussion in Sections 4.4 and 4.5), impervious surfaces may not directly drain to the BMP because the loads are reduced by land use changes or other methods in the model.

Accounting for impervious surfaces treated for these alternative BMPs is not clearly defined in MAST but the NPDES Accounting Protocol provides guidance. Table 4 illustrates that the impervious surface treatment requirement is exceeded in the proposed 2017 and 2025 milestones using just urban BMPs but that treatment is even greater if impervious equivalencies are applied to the alternative BMPs as well.

Based on the MAST impervious landuse allocated to SHA and the 20%/30% treatment requirements, SHA needs to provide treatment for 6,501 acres of impervious to meet the requirements of the WIP I document.

Table 4. SHA MS4 I/II Impervious Treatment based on MAST[3]

	MAST Total Impervious (AC)	MAST 2009 Baseline Treatment Provided (AC)	MAST 2009 Baseline Treatment + SHA Pre-1985 Treatment Requirement (AC)	2017 Scenario Treatment without Impervious Equivalencies (AC)[1]	2025 Target Treatment without Impervious Equivalencies (AC)[1]	2025 Target Treatment with Impervious Equivalencies (AC)[2]
Impervious Acres	26,988	8,162	14,663	14,236	15,872	20,184
Percent Based on Total SHA Impervious Land Use	100%	30%	54%	53%	59%	75%

Notes:

1. Includes 2009 baseline and all milestones preceding that designated. Does not include impervious equivalencies for alternative BMPs.
2. Impervious Equivalencies for the 2025 Target treatment strategy are computed below using the 2010 NPDES Accounting Protocol:

Stream Restoration (100 LF Restored = 1 Imp. AC):	74,468 LF/100 =	745 Imp. AC
Urban Tree Planting (1 AC Planted = 0.38 Imp. AC):	5,657 AC x 0.38 =	2,150 Imp. AC
Catch Basin Cleaning (1 TON = 0.4 Imp. AC):	7,073,080 LBS x. 0002 =	1,415 Imp. AC
Urban Forest Buffers (1 Acres = 0.34 Imp. AC):	6.61 AC x 0.34 =	2 Imp, AC
Total Impervious Equivalent BMPs:		**4,312 Imp. AC**

3. Evaluation for overlapping drainage areas or BMP treatment trains has not been made at this time. This impervious treatment evaluation will be adjusted once this evaluation has been performed.

4.3 Acquiring Permits and Environmental Clearances for TMDL Projects

The acquisition of permits is a key component for the successful completion of the 2025 strategies and directly affects the ability to construct BMPs such as stream restoration, outfall stabilization and urban stormwater BMPs. Permits necessary can include tidal and nontidal wetlands, US waters, waterway construction, stormwater management (SWM), erosion and sediment control (ESC), NPDES construction activity, floodplain, water quality certification, forest conservation and reforestation, roadside tree, and Chesapeake Bay critical areas. In addition, the National Environmental Policy Act (NEPA) and the Maryland Environmental Policy Act (MEPA) ensure that properties are investigated for potential negative environmental and cultural impacts. Two issues are fundamental to the successful acquisition of the necessary permits: agency concurrence with project scope and permit/clearance acquisition timeframes.

Timeframes range from 6 months for SWM and ESC approvals, to 10-12 months for wetlands and include not only State regulatory approval but also Federal commenting authorities. SHA believes that in order to achieve successful implementation given that these are environmentally beneficial projects, the hefty goals to achieve by 2017 and 2025, and resource limitations, it is crucial to focus on permit streamlining. Therefore, SHA has begun to pursue general permits and will rely on other streamlining processes.

4.4 Agricultural Practices Occurring on SHA-Owned Land

SHA owns hundreds of acres of land that are currently undergoing agricultural farming practices. SHA will need to coordinate with the individual farmers to determine the exact nature of the farming activities and discuss the possibility of implementing potential agricultural best management practice strategies in order to receive additional nutrient and sediment reductions. Potential agricultural strategies that will be investigated include, but are not limited to:

- Forest Buffers
- Grass Buffers
- Tree Plantings
- Conservation Tillage
- Conservation Plans
- Land Retirement
- Cover Crops
- Continuous No-Till Practices
- Decision Agriculture Practices
- Enhanced Nutrient Management

Currently, SHA has no mechanism in MAST to report agricultural practices. SHA will work with MDE to determine the best approach for reporting agriculture practices implemented on SHA-owned land through MAST.

4.5 Utilizing Agricultural BMPs for SHA WLA Credit

When developing our scenarios in MAST, it was discovered that several of the 'land use change' BMPs that SHA currently implements are not available to us because they are based on changes from agricultural land uses rather than the two urban land uses allocated to SHA (impervious and pervious).

Non-Urban Stream Restoration

SHA is investigating stream restoration projects that are located outside the SHA right-of-way. The majority of these opportunities exist within agricultural land uses. For these opportunities, SHA would like to request the use of the Non-Urban Stream Restoration strategy, which would require a new agricultural land use option for SHA within the urban sector in MAST. This would be a more appropriate estimation of the reductions associated with these stream restoration efforts.

Land Use Changes for Pervious Urban to Forest vs. Agriculture to Forest

In coordination with DNR, the SHA participated in the Million Tree Initiative that resulted in hundreds of acres of tree plantings throughout Maryland over the past few years. As part of this effort, SHA planted trees on DNR property in all MS4 counties, in areas located off the SHA right-of-way. In MAST, SHA does not have a mechanism to report these tree plantings. SHA would like to request the inclusion of a new agricultural land use in the Urban Sector that would utilize the same reductions that currently exist within the Agricultural Sector Tree Planting strategy. Table 5, SHA Million Tree Initiative Plantings, outlines the total acreage per MS4 county for the SHA 2011 and 2013 milestones. Currently, these acreages are included as part of the Urban Sector Tree Plantings within the SHA MAST scenarios.

Additionally, SHA is currently investigating tree plantings outside of the through-highway right-of-way that are in rural/agricultural areas that would also be more appropriate under the agricultural land use discussed above.

Table 5. SHA Million Tree Initiative Plantings

County	2011 - Current Capacity (AC)	2013 (AC)
Anne Arundel		2.3
Baltimore	87.9	65.9
Carroll	8.0	
Cecil	69.0	5.0
Charles		110.0
Frederick	49.0	
Harford		
Howard	102.0	
Montgomery	9.0	
Prince George's		31.5
Washington	3.3	13.7
Total	**328.2**	**228.4**

Non-Structural Wetland Restoration

Over the past few years, SHA has created 16.5 acres and enhanced 2.8 acres or wetlands, all within MS4 Phase I Counties. These are man-made wetlands that do not contain structures and are exclusively stewardship in nature. Table 6, Wetland Creation/Enhancement Sites, highlights the details for each site.

The *Chesapeake Bay Phase 5.3 Community Watershed Model, Section 6.7.6 Wetlands and Wet Ponds* refers to a water impoundment structure that intercepts stormwater runoff and states that:

> *"wet ponds and wetlands used as a BMP for managing urban stormwater runoff are man-made landscape features that have characteristics and functions similar to their natural counterparts."*

Although the SHA man-made wetlands do not contain impoundment structures, they do function very similar to the wet ponds and wetlands discussed above by providing sediment and flood flow retention and by providing de-nitrification. The thinking at SHA is that the man-made wetlands that exist within an urban landscape and intercept stormwater runoff should receive the same nutrient and sediment reductions as the wet ponds and wetlands discussed above. If this is an acceptable method, the drainage area for each man-made wetland would need to be determined so that the credit would be based on the larger drainage area. The efficiencies associated with urban wetlands and wet ponds would be used to calculate the reductions of nitrogen, phosphorus, and sediment within MAST. At this point the wetland creation acreages in Table 6 have not been incorporated into the SHA 2011 capacity or 2013 milestone projections.

Table 6. Wetland Creation/Enhancement Sites

Site Name	County	Creation (AC)	Enhancement (AC)	Pre-BMP Land Use
2011 Capacity				
Magness Farm	Harford	5	2	Agriculture
2013 Milestone				
Dorsey Run	Howard	11.5	0.8	Urban

Agricultural Wetland Restoration

For created wetlands outside of the SHA right-of-way, SHA would like to request the use of the agricultural efficiencies for wetland creation and enhancement, which would require a new land use for SHA within the Urban Sector in MAST. These efficiencies are cited in the *Chesapeake Bay Phase 5.3 Community Watershed Model, Section 6.5.9 Agricultural Wetland Restoration*. SHA would like to utilize these efficiencies within MAST when developing strategies; however, SHA does not currently have access to agricultural land uses. Table 6 differentiates the wetland sites by urban or agricultural pre-BMP land use.

4.6 Nutrient Management

In support of the Maryland Nutrient Management Law, a Nutrient Management Plan (NMP) is developed for all fertilizer applications on SHA right-of-way. SHA partners with the Maryland Department of Agriculture and the University of Maryland to develop specifications and fertilizer application rates. The default fertilizer application rate is 1,000 lb per acre of the standard fertilizer analysis [10-22-22 (50% Ureaform) for projects advertised prior to 2008; 20-16-12 (83% Ureaform with Monoammonium Phosphate and Sulfate of Potash) for projects advertised in 2008 and later]. Soil tests for nutrient levels are conducted when possible on topsoil being placed on SHA projects. These soil tests are used to develop custom NMPs to reduce the amount of phosphorus and potassium being applied for turfgrass establishment operations on the project (Table 7). Nitrogen levels remain constant at the University of Maryland recommended levels to ensure optimal growing conditions and successful turfgrass establishment.

Table 7. Phosphorus Reduction via Nutrient Management Plans

Calendar Year	Turfgrass Establishment (AC)	Standard Application of Phosphorus (LB)	Actual Application of Phosphorus (LB)	Phosphorus Reduction via NMPs (LB)
2007	162.4	35,728	25,438	10,290
2008	74.7	16,083	12,234	3,849
2009	106.3	20,555	14,996	5,559
2010	135.7	25,931	21,819	4,112
2011	104.8	17,481	8,641	8,840

Specification Change

On September 4, 2007, SHA released a Special Provisions Insert for Sections 705 – Turfgrass Establishment and 708 – Turfgrass Sod Establishment (herein referred to as the 2008 Specifications). The 2008 Specifications changed the standard fertilizer analysis from 10-22-22 (50% UF) to 20-16-12 (83% UF with MAP & SOP) for projects advertised in 2008 or later. This specification change resulted in a decrease of 60 pounds of phosphorus per acre for the default fertilizer application rates when performing turfgrass establishment operations on projects advertised under the 2008 Specifications (Table 8).

Table 8. Phosphorus Reduction via 2008 Specification Changes

Calendar Year	Turfgrass Establishment (acres)		Phosphorus Reduction (LBS)
	2001 Specifications	2008 Specifications	
2007	162.4	-	-
2008	68.9	5.8	348
2009	59.1	47.2	2832
2010	70.2	65.5	3930
2011	11.9	92.4	5,544

4.7 Turfgrass Maintenance Operations

SHA suspended the roadside turfgrass maintenance program in 2009. The roadside turfgrass maintenance program applied fertilizer to roadside areas where turfgrass coverage was thin and additional groundcover was required. The suspension of this program resulted in an average annual credit of 57,022 lb of nitrogen and 11,679 lb of phosphorus through the elimination of turfgrass maintenance fertilizer applications (Table 9). Based on these changes, SHA would like to apply reductions to our 2011 capacity totals.

Table 9. Nitrogen and Phosphorus Reductions via Suspending Turfgrass Maintenance Operations

Calendar Year	Acres	Nitrogen Application (LB)	Phosphorus Application (LB)
2007	702.6	50,932	10,329
2008	556.8	63,111	13,028
2-Year Average	**629.7**	**57,022**	**11,679**